

CLAIMS

WHAT IS CLAIMED IS:

1. A system for monitoring, configuring, programming and/or diagnosing operation of at least one vehicle, comprising:

an on-board unit disposed on the vehicle to send and receive data corresponding to at least one vehicle operating characteristic;

a plurality of modular applications, each application having an associated function that processes the data corresponding to said at least one vehicle operating characteristic obtained via the on-board unit; and

an interface that allows selection among the plurality of modular applications to create a customized system.

2. The system of claim 1, wherein the on-board unit includes:

at least one on-board unit interface to support communication between the on-board unit and at least one device outside the on-board unit;

a processor that manages the data sent and received by the on-board unit via said at least one interface; and

a memory coupled to the processor.

3. The system of claim 2, wherein said at least one on-board unit interface is at least one selected from the group consisting of:

a wireless interface that supports communication with a wireless communication system;

a vehicle interface that supports communication with at least one vehicle component via a vehicle data bus;

a user interface that supports communication with a user;

a serial interface that supports communication with at least one of a driver interface and an on-vehicle device; and

a global positioning interface that supports communication with a global positioning system (GPS) device.

4. The system of claim 3, wherein the vehicle interface includes at least one selected from the group consisting of:

a data parser/requester module that handles non-application specific interfacing between the processor and the vehicle data bus; and

an application specific module coupled to the data parser/requestor module that handles application specific interfacing between the processor and the vehicle data bus.

5. The system of claim 1, wherein the modular applications are selected from the group consisting of third-party applications, system-supplied applications, and core services.

6. The system of claim 5, wherein at least one of the third-party applications and system-supplied applications function using information from at least one core service.

7. The system of claim 5, wherein the core services include a snapshot service that obtains a set of vehicle parameter values over time.

8. The system of claim 7, wherein the snapshot service causes the on-board unit to cache a selected number of parameter readings with respect to a triggering event.

9. The system of claim 8, wherein the on-board unit caches the selected number of parameter readings by storing a plurality of parameter readings at selected time intervals.

10. The system of claim 5, wherein the core services include a get stored values service that outputs at least one vehicle controller value in response to a request, wherein the get stored values service outputs a current vehicle controller value if the vehicle controller is available at the time of the request and output a stored

vehicle controller value in the on-board unit if the vehicle controller is not available at the time of the request.

11. The system of claim 10, wherein the get stored values service collects vehicle controller values at a selected time interval and stores a most recent vehicle controller value as the current vehicle controller value.

12. The system of claim 5, wherein the core services include an alert service that detects at least one of a solicited fault and an unsolicited fault.

13. The system of claim 12, wherein the alert service detects a solicited fault by filtering faults and outputting only faults solicited by a user.

14. The system of claim 12, wherein the alert service includes at least one of the functions from the group consisting of adding and removing individual faults, cancelling the alert service for a given fault after an alert has been fired, firing an alert after a parameter exceeds a selected threshold for a selected time period, and comparing a saved parameter with a current parameter to detect tampering.

15. The system of claim 5, wherein the core services include a change parameter service that changes at least one vehicle parameter in response to a request.

16. The system of claim 1, wherein the interface is at least one selected from the group consisting of:

- a user interface that supports interaction with a human user; and
- a machine-to-machine interface.

17. The system of claim 16, wherein the user interface is a graphical user interface.

18. The system of claim 1, further comprising a server linking the on-board unit to the interface via the modular applications.

19. The system of claim 18, wherein the server includes at least one of the group consisting of:

a web/application server containing logic defining the modular applications;

a vehicle server that acts as a translator between the modular applications and the on-board unit;

a communications server to support communication via a wireless network;

and

a database server containing at least one relational data table retaining information associated with the vehicle.

20. The system of claim 18, wherein at least one of the server and the modular applications form an application service provider (ASP) infrastructure.

21. The system of claim 1, wherein the plurality of modular applications include a remote diagnostics application.

22. The system of claim 1, wherein the plurality of modular applications include a leased vehicle management application.

23. The system of claim 1, wherein the plurality of modular applications includes at least one from the group consisting of a remote diagnostics application, a leased vehicle management application, a fuel economy application, a vehicle locating application, a trip reporting application, an engine management application, a maintenance alert application, a vehicle configuration application, and a warranty management application.

24. The system of claim 1, wherein at least one of the plurality of modular applications correlates data between at least two vehicle controllers on the same vehicle.

25. The system of claim 1, wherein at least one of the plurality of modular applications establishes a setting for a plurality of vehicles with one command sent via the interface.

26. An on-board unit disposed on a vehicle for use in a system for monitoring, configuring, programming and/or diagnosing operation of at least one vehicle, comprising:

at least one on-board unit interface to support communication between the on-board unit and at least one device outside the on-board unit;

a processor that manages the data sent and received by the on-board unit via said at least one interface; and

a memory coupled to the processor.

27. The on-board unit of claim 26, wherein said at least one on-board unit interface is at least one selected from the group consisting of:

a wireless interface that supports communication with a wireless communication system;

a vehicle interface that supports communication with at least one vehicle component via a vehicle data bus;

an on-board user interface that supports communication with a user;

a serial interface that supports communication with at least one of a driver interface and an on-vehicle device; and

a global positioning interface that supports communication with a global positioning system (GPS) device.

28. The on-board unit of claim 27, wherein the vehicle interface includes at least one selected from the group consisting of:

a data parser/requester module that handles non-application specific interfacing between the processor and the vehicle data bus; and

an application specific module coupled to the data parser/requester module that handles application specific interfacing between the processor and the vehicle data bus.

29. A method for monitoring, configuring, programming and/or diagnosing operation of at least one vehicle, comprising:

obtaining data corresponding to at least one vehicle operating characteristic from an on-board unit on the vehicle;

providing a plurality of modular applications that are selectable by the user to create a customized system; and

processing the data corresponding to at least one vehicle operating characteristic obtained via the on-board unit according to at least one function associated with at least one selected modular application.

30. The method of claim 29, further comprising obtaining a set of vehicle parameter values over time.

31. The method of claim 30, wherein the obtaining step includes:

detecting a triggering event; and

caching a selected number of parameter readings with respect to a triggering event.

32. The method of claim 31, wherein the caching step includes storing a plurality of parameter readings at selected time intervals.

33. The method of claim 29, further comprising:

detecting a request for a vehicle controller value;

outputting a current vehicle controller value if a vehicle controller is available at the time of the request; and

output a stored vehicle controller value if the vehicle controller is not available at the time of the request.

34. The method of claim 33, further comprising collecting vehicle controller values at a selected time interval and storing a most recent vehicle controller value as the current vehicle controller value.

35. The method of claim 29, further comprising:
detecting at least one of a solicited fault and an unsolicited fault; and
firing an alert after the detecting step.

36. The method of claim 35, wherein detecting a solicited fault includes
filtering faults to output only faults solicited by a user.

37. The method of claim 35, further comprising at least one step selected
from the group consisting of adding and removing individual faults, cancelling the
alert service for a given fault after an alert has been fired, firing an alert after a
parameter exceeds a selected threshold for a selected time period, and comparing a
saved parameter with a current parameter to detect tampering.

38. The method of claim 29, further comprising changing at least one
vehicle parameter in response to a request.

39. The method of claim 29, further comprising translating data between
the modular applications and the on-board unit.

40. The method of claim 29, wherein the providing step includes providing
a remote diagnostics application.

41. The method of claim 29, wherein the providing step includes providing
a leased vehicle management application.

42. The method of claim 29, wherein the providing step provides at least
one from the group consisting of a remote diagnostics application, a leased vehicle
management application, a fuel economy application, a vehicle locating application, a
trip reporting application, an engine management application, a maintenance alert
application, a vehicle configuration application, and a warranty management
application.

43. The method of claim 29, further comprising correlating data between at least two vehicle controllers on the same vehicle.

44. The method of claim 29, wherein at least one of the plurality of modular applications establishes a setting for a plurality of vehicles with one command sent via the interface.

$$\begin{pmatrix} p_{11} \\ p_{12} \\ p_{13} \\ p_{14} \\ p_{15} \\ p_{16} \\ p_{17} \\ p_{18} \\ p_{19} \\ p_{20} \\ p_{21} \\ p_{22} \\ p_{23} \\ p_{24} \\ p_{25} \\ p_{26} \\ p_{27} \\ p_{28} \\ p_{29} \\ p_{30} \\ p_{31} \\ p_{32} \\ p_{33} \\ p_{34} \\ p_{35} \\ p_{36} \\ p_{37} \\ p_{38} \\ p_{39} \\ p_{40} \\ p_{41} \\ p_{42} \\ p_{43} \\ p_{44} \\ p_{45} \\ p_{46} \\ p_{47} \\ p_{48} \\ p_{49} \\ p_{50} \\ p_{51} \\ p_{52} \\ p_{53} \\ p_{54} \\ p_{55} \\ p_{56} \\ p_{57} \\ p_{58} \\ p_{59} \\ p_{60} \\ p_{61} \\ p_{62} \\ p_{63} \\ p_{64} \\ p_{65} \\ p_{66} \\ p_{67} \\ p_{68} \\ p_{69} \\ p_{70} \\ p_{71} \\ p_{72} \\ p_{73} \\ p_{74} \\ p_{75} \\ p_{76} \\ p_{77} \\ p_{78} \\ p_{79} \\ p_{80} \\ p_{81} \\ p_{82} \\ p_{83} \\ p_{84} \\ p_{85} \\ p_{86} \\ p_{87} \\ p_{88} \\ p_{89} \\ p_{90} \\ p_{91} \\ p_{92} \\ p_{93} \\ p_{94} \\ p_{95} \\ p_{96} \\ p_{97} \\ p_{98} \\ p_{99} \end{pmatrix}$$